

Distillation lab: An exploration of intermolecular forces.

46 points (normal rubric x 2)

- 5 pts extra credit for papers submitted by Friday 09.
- 'regular due date' (full credit) = Friday Dec 16.
- (- 5 pts for papers submitted after Dec. 13.. meaning anyone that is planning on emailing me something over Winter break).

*Note: students may work in groups of up to three. (Four students may work together under exceptional circumstances, please see Clark to describe such circumstances).*

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This lab of separating a mixture of alcohol from water involves many different aspects of chemistry and physics. After completing the distillation lab, students should construct a report which addresses the following subjects. The order of the topics is up to the student-groups to decide but fundamentally, the students should address not only how the process of distillation works (including the design and operation of the apparatus and the data we collected) but also should address the following list of chemical principals.

Note: Students should include labeled diagrams of the apparatus describing the function of each element. Students should describe how heat flow and temperature relate to each step in the process.

How do alcohols compare to alkanes? Which Alcohol was this lab based on? How did the process of distillation work? What properties do water and alcohol have that allow them to be separated through distillation? How does temperature of a substances boiling point relate to the intermolecular forces that bind them together (as solids and liquids)? What is a polar molecule? What factors in elements themselves lead to molecules becoming polar? Why did the two volumes of alcohol and water not add up as the math would suggest? How did the distillation apparatus itself work? Why did the temperature of the 'boiling point' change throughout the experiment? What does fractional distillation mean? How did the alcohol content of the first fraction compare to the secondary and tertiary fractions? How did they compare to the concentration of the initial solution? How did the volume ratios of the alcohol compare to the mass ratios? How is concentration usually described? What was the concentration of alcohol initially after we mixed two equal volumes? How did you determine this? Why do we need to utilize the 'tables of concentration' as a function of temperature and density. How did we determine the alcohol concentrations in the three (or four) different fractions? What is the history of distillation? Why have people been interested in this process? What industries utilize this process? How does the concept of 'proof' of alcohol concentration relate to the concept of % alcohol?

Note: this document also represents the first portion of the final, unit review guide. -